

(2) For commuter category airplanes, the airspeed must return to within plus or minus 7.5 percent of the original trim airspeed for the cruising condition specified in § 23.175(b).

(c) The stick force must vary with speed so that any substantial speed change results in a stick force clearly perceptible to the pilot.

[Doc. No. 4080, 29 FR 17955, Dec. 18, 1964, as amended by Amdt. 23-14, 38 FR 31820 Nov. 19, 1973; Amdt. 23-34, 52 FR 1828, Jan. 15, 1987]

§ 23.175 Demonstration of static longitudinal stability.

Static longitudinal stability must be shown as follows:

(a) *Climb*. The stick force curve must have a stable slope at speeds between 85 and 115 percent of the trim speed, with—

- (1) Flaps retracted;
- (2) Landing gear retracted;
- (3) Maximum continuous power; and
- (4) The airplane trimmed at the speed used in determining the climb performance required by § 23.69(a).

(b) *Cruise*. With flaps and landing gear retracted and the airplane in trim with power for level flight at representative cruising speeds at high and low altitudes, including speeds up to V_{NO} or V_{MO}/M_{MO} , as appropriate, except that the speed need not exceed V_H —

(1) For normal, utility, and acrobatic category airplanes, the stick force curve must have a stable slope at all speeds within a range that is the greater of 15 percent of the trim speed plus the resulting free return speed range, or 40 knots plus the resulting free return speed range, above and below the trim speed, except that the slope need not be stable—

- (i) At speeds less than $1.3 V_{S1}$; or
- (ii) For airplanes with V_{NE} established under § 23.1505(a), at speeds greater than V_{NE} ; or
- (iii) For airplanes with V_{MO}/M_{MO} established under § 23.1505(c), at speeds greater than V_{FC}/M_{FC} .

(2) For commuter category airplanes, the stick force curve must have a stable slope at all speeds within a range of 50 knots plus the resulting free return speed range, above and below the trim speed, except that the slope need not be stable—

- (i) At speeds less than $1.4 V_{S1}$; or

(ii) At speeds greater than V_{FC}/M_{FC} ; or

(iii) At speeds that require a stick force greater than 50 pounds.

(c) *Landing*. The stick force curve must have a stable slope at speeds between $1.1 V_{S1}$ and $1.8 V_{S1}$ with—

- (1) Flaps in the landing position;
- (2) Landing gear extended; and
- (3) The airplane trimmed at—

(i) V_{REF} , or the minimum trim speed if higher, with power off; and

(ii) V_{REF} with enough power to maintain a 3 degree angle of descent.

[Doc. No. 27807, 61 FR 5190, Feb. 9, 1996]

§ 23.177 Static directional and lateral stability.

(a)(1) The static directional stability, as shown by the tendency to recover from a wings level sideslip with the rudder free, must be positive for any landing gear and flap position appropriate to the takeoff, climb, cruise, approach, and landing configurations. This must be shown with symmetrical power up to maximum continuous power, and at speeds from $1.2 V_{S1}$ up to V_{FE} , V_{LE} , V_{NO} , V_{FC}/M_{FC} , whichever is appropriate.

(2) The angle of sideslip for these tests must be appropriate to the type of airplane. The rudder pedal force must not reverse at larger angles of sideslip, up to that at which full rudder is used or a control force limit in § 23.143 is reached, whichever occurs first, and at speeds from $1.2 V_{S1}$ to V_O .

(b)(1) The static lateral stability, as shown by the tendency to raise the low wing in a sideslip with the aileron controls free, may not be negative for any landing gear and flap position appropriate to the takeoff, climb, cruise, approach, and landing configurations. This must be shown with symmetrical power from idle up to 75 percent of maximum continuous power at speeds from $1.2 V_{S1}$ in the takeoff configuration(s) and at speeds from $1.3 V_{S1}$ in other configurations, up to the maximum allowable airspeed for the configuration being investigated (V_{FE} , V_{LE} , V_{NO} , V_{FC}/M_{FC} , whichever is appropriate) in the takeoff, climb, cruise, descent, and approach configurations. For the landing configuration, the power must